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April 15, 2016
NRC-16-0013

10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

- References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43
- 2) DTE Electric Company Letter to the NRC, "Licensee Event Report (LER) No. 2015-006," NRC-15-0094, dated November 5, 2015 (ML15309A422)

Subject: Licensee Event Reports (LERs) Nos. 2015-010 and
2015-011 and Supplement to LER No. 2015-006

Pursuant to 10 CFR 50.73 (a)(2)(iv)(A) and (a)(2)(v)(C), DTE Electric Company (DTE) is submitting the enclosed supplement to LER No. 2015-006, Reactor Scram Due to Loss of Turbine Building Closed Cooling Water. In addition, pursuant to 10 CFR 50.73 (a)(2)(iv)(A), DTE is submitting LER Nos. 2015-010, Manual Actuation of Reactor Core Isolation Cooling System due to a Leak in the Standby Feedwater System, and 2015-011, Reactor Protection System and Containment Isolation Actuation due to Reaching Reactor Water Level 3 Setpoint.

The supplement provides details that were not available for inclusion in Reference 2 and clarifies reporting of the Primary Containment isolation actuations.

LERs 2015-010 and 2015-011 were generated to separate out two events. These two events were included in LER 2015-006, Revision 0, rather than being reported as separate events per the guidance in NUREG-1022, Revision 3.

No commitments are being made in this LER.

Should you have any questions or require additional information, please contact Mr. Alan I. Hassoun of my staff at (734) 586-4287.

Sincerely,



Keith J. Polson
Site Vice President

Enclosures:

1. Supplement to LER 2015-006, Reactor Scram Due to Loss of Turbine Building Closed Cooling Water
2. LER 2015-010, Manual Actuation of Reactor Core Isolation Cooling System Due to a Leak in the Standby Feedwater System
3. LER 2015-011, Reactor Protection System and Containment Isolation Actuation Due to Reaching Reactor Water Level 3 Setpoint

cc: NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Michigan Public Service Commission
Regulated Energy Division (kindschl@michigan.gov)

**Enclosure 1 to
NRC-16-0013**

**Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43**

**Supplement to LER 2015-006, Reactor Scram Due to
Loss of Turbine Building Closed Cooling Water**

**LICENSEE EVENT REPORT (LER)**
(See Page 2 for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollections.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

Fermi 2

2. DOCKET NUMBER

05000 341

3. PAGE

1 OF 5

4. TITLE

Reactor Scram Due to Loss of Turbine Building Closed Cooling Water

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
09	13	2015	2015	006	01	04	15	2016	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
1			<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)		
			<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
			<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
			<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)		
100			<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
			<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)		
			<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)		<input checked="" type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)		
			<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(D)		<input type="checkbox"/> 73.77(a)(2)(i)		
			<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)		
			<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> OTHER		Specify in Abstract below or in NRC Form 366A			

12. LICENSEE CONTACT FOR THIS LER**LICENSEE CONTACT**

Fermi 2 / Alan I. Hassoun - Manager, Nuclear Licensing

TELEPHONE NUMBER (Include Area Code)

(734) 586-4287

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	KB	HX	Y030	Y					

14. SUPPLEMENTAL REPORT EXPECTED☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO**15. EXPECTED SUBMISSION DATE**

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 2305 EDT on September 13, 2015, a manual reactor scram was initiated in response to a loss of Turbine Building Closed Cooling Water (TBCCW). Reactor Water Level went below the Level 3 setpoint automatically actuating the Reactor Protection System and Primary Containment Isolation Systems (PCIS). A tube leak in the East TBCCW heat exchanger tripped the running TBCCW pumps which resulted in loss of TBCCW. As a result, the Reactor Feed Pumps lost cooling and had to be secured. At 2310 EDT, the Standby Feedwater system was initiated. The loss of TBCCW cooling tripped all Station Air Compressors, which caused Instrument Air header pressure to degrade and the Secondary Containment (SC) isolation dampers to drift closed. This resulted in a positive SC differential pressure. Operators started the Standby Gas Treatment system and manually inserted a SC isolation signal. SC vacuum was promptly restored to within Technical Specification limits. The degradation of Instrument Air header pressure also caused Main Steam Isolation Valves to drift and be manually closed, which led to an expected loss of Condenser vacuum and resulted in isolation of PCIS Group 1. The East TBCCW heat exchanger was repaired. The Root Cause Evaluation determined that important internal equipment operating history and industry Operating Experience (OE) were not identified and implemented. The following corrective actions to prevent recurrence were identified: current heat exchanger inspection scope, frequency, and techniques will be compared against previous historical failures and plant procedures will be revised in consideration of industry and site OE.

NRC FORM 366A
(11-2015)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018



LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Fermi 2	05000- 341	YEAR 2015	SEQUENTIAL NUMBER 006	REV NO. 01

NARRATIVE

Initial Plant Conditions

Mode: 1
Reactor Power: 100 percent

There were no structures, components, or systems that were inoperable at the start of the event that contributed to the event.

Description of the Event

At 2305 EDT on September 13, 2015, a manual reactor scram was initiated in response to a loss of all Turbine Building Closed Cooling Water (TBCCW) [[KB]] in accordance with plant procedures. All control rods [[AC]] were fully inserted and the lowest Reactor Water Level (RWL) reached was 137 inches above Top of Active Fuel which is below the RWL Level 3 setpoint of 173 inches. Primary Containment Isolation Systems (PCIS) [[JM]] Groups 4, 13, and 15 associated with RWL Level 3 occurred as expected. Decay heat was initially being removed through the Main Turbine Bypass System [[JI]] to the Main Condenser [[COND]]; however, as a result of the loss of TBCCW, the Reactor Feed Pumps [[SJ]] lost cooling and had to be secured. At 2310 EDT, the Standby Feedwater (SBFW) [[SJ]] system was initiated.

A field investigation later verified that a tube leak occurred in the East TBCCW heat exchanger [[HX]], causing General Service Water (GSW) to flow into the lower pressure TBCCW system. This resulted in a TBCCW head tank [[TK]] level increase and water flowing from the TBCCW head tank relief valve [[RV]]. The interaction of TBCCW system pressure fluctuations with the TBCCW tank instrumentation ultimately caused a trip of the running TBCCW pumps and a loss of TBCCW.

The loss of TBCCW also caused all Station Air Compressors (SACs) [[CMP]] to trip on loss of cooling. The loss of SACs caused the Instrument Air header pressure to degrade to the point at which the Secondary Containment (SC) isolation dampers [[DMP]] drifted closed. This resulted in the Reactor Building [[NG]] pressure going positive and exceeding the Technical Specification minimum requirement of -0.125 inches water column. At 2325 EDT, Operators started the Standby Gas Treatment System (SGTS) [[BH]] and manually inserted a SC isolation signal. SC vacuum was restored to within Technical Specification limits. The Technical Specification limit was exceeded for approximately 3 minutes and 43 seconds and the maximum pressure recorded was 1.932 inches water column. Additionally, Operators were monitoring for expected Main Steam Isolation Valve (MSIV) [[ISV]] drift due to the degraded Instrument Air header pressure. When outboard MSIVs were observed to be drifting, Operators closed the outboard and inboard MSIVs at 2345 EDT. At 2352 EDT, Low-Low Set Safety Relief Valves (SRVs) [[RV]] reached their setpoint and began automatic cycling to control reactor pressure. The manual closure of MSIVs led to an expected loss of Condenser vacuum which resulted in the isolation of PCIS Group 1 at 0001 EDT on September 14, 2015.

The manual scram, Reactor Protection System (RPS) actuation due to reaching RWL Level 3, and the containment isolations are reportable under 10 CFR 50.73(a)(2)(iv)(A), as events or conditions that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B), including the RPS and containment isolation systems. A 4-hour event notification (No. 51391) was made to the NRC based on meeting the reporting criteria of 10 CFR 50.72(b)(2)(iv)(B) and a follow-up notification was made for the 8-hour reporting criteria in 10 CFR 50.72 (b)(3)(iv)(A) for RWL Level 3 and containment isolations.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
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The loss of SC function is reportable under 10 CFR 50.73(a)(2)(v)(C) as an event or condition that could have prevented the fulfillment of a safety function needed to control the release of radioactive material. An 8-hour notification was made to the NRC based on meeting the reporting criteria of 10 CFR 50.72(b)(3)(v)(C).

The manual actuation and isolation of the MSIVs and the automatic isolation of PCIS Group 1 are reportable under 10 CFR 50.73(a)(2)(iv)(A), as events or conditions that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B). An 8-hour follow-up notification was made to the NRC based on meeting the reporting criteria of 10 CFR 50.72(b)(3)(iv)(A) for this ongoing event.

There were no radiological releases associated with this event.

Significant Safety Consequences and Implications

There were no significant safety consequences associated with this event. At no time during this event was there a potential for endangering the public health and safety.

Manual Scram

The safety significance with respect to the manual scram is considered less than minimal, since a manual scram is inherently a safety function. No safety-related equipment was out of service at the time of the event and all offsite power sources were adequate and available throughout the duration of the event.

Loss of Secondary Containment

The specified safety function of the SC is to contain, dilute, and hold up fission products that may leak from primary containment following a Design Basis Accident (DBA). SC in conjunction with SGTS is designed to reduce the activity level of the fission products prior to release to the environment and to isolate and contain fission products that are released during certain operations that take place inside primary containment, when primary containment is not required to be OPERABLE, or that take place outside primary containment. For the SC to be considered OPERABLE, it must have adequate leak tightness to ensure that the required vacuum can be established and maintained.

During this particular event, SC vacuum briefly exceeded the Technical Specification limit when the isolation dampers drifted closed. When the dampers drifted closed, Operations started the SGTS system, manually inserted a SC isolation signal, and restored SC vacuum within the Technical Specification limit. In Chapter 15 of the Fermi 2 Updated Final Safety Analysis Report (UFSAR), Reactor Building Heating, Ventilation, and Cooling (RBHVAC) is assumed lost at the onset of a Loss of Coolant Accident (LOCA) concurrent with a Loss of Offsite Power. As a result, calculations show that the SC would be pressurized until the SGTS restores vacuum. For this particular event, the SC vacuum degraded when the SACs tripped on a loss of cooling causing the SC isolation dampers to drift closed. The structural integrity (i.e., leak tightness) of the SC was re-confirmed when the safety-related SGTS restored vacuum to greater than 0.125 inches of water column.

If the DBA LOCA for SC concurrent with a Loss of Offsite Power were to occur during the time when SC pressure exceeded the Technical Specification limit, the SC was sufficiently leak tight such that the SGTS would still have established and maintained vacuum greater than the Technical Specification required value.

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The radiological consequences of the DBA LOCA for SC contained in Chapter 15 of the Fermi 2 UFSAR result in doses that are below 10 CFR 50.67. The SC is assumed to be at a pressure of -0.125 inches water column at the onset of the LOCA. For this particular event, had the DBA LOCA for SC actually occurred, the increase in magnitude of radiological dose as a result of increased draw-down time from starting at 1.932 vice -0.125 inches of water column, would be minimal and negated by conservative assumptions in the existing analysis (e.g., 100% exfiltration from SC during the first 15 minutes of drawdown with SGTS in operation, 10% exfiltration from SC with SGTS in operation throughout the remaining 30 day duration of the accident, no holdup time in SC throughout the 30 day duration of the accident, and all exfiltration and filtered releases are at ground level).

Automatic Reactor Protection System (RPS) and Containment Isolation System Actuation

Following the manual scram, Reactor Pressure Vessel (RPV) water level briefly dropped below RWL Level 3 and caused a valid automatic RPS actuation signal. Since all control rods were already fully-inserted into the core, the safety function was already fulfilled. Containment system actuation including the isolation of PCIS Groups 4, 13, and 15 is an expected response when reaching the RWL Level 3 setpoint.

The closure of MSIVs is an analyzed transient in Section 15.2.4 of the Fermi 2 UFSAR. Reactor level and pressure were maintained using SBFW and Low-Low Set SRVs. The isolation of PCIS Group 1 is an expected response when losing Condenser vacuum due to manual closure of MSIVs.

No safety-related equipment was out of service at the time of the event and all offsite power sources were adequate and available throughout the duration of the event.

Cause of the Event

- Manual Scram - A tube leak occurred in the East TBCCW heat exchanger, causing GSW to flow into the lower pressure TBCCW system ultimately causing a trip of the running TBCCW pumps which resulted in a loss of TBCCW. The primary failure cause of the TBCCW heat exchanger tube leak was stress corrosion cracking. The Root Cause evaluation determined that important internal equipment operating history and industry operating experience were not identified and implemented in the TBCCW heat exchanger monitoring requirements during the development of the site Balance of Plant Heat Exchanger Program.
- Manual Closure of MSIVs - The loss of TBCCW caused all SACs to trip on loss of cooling. The loss of SAs caused the Instrument Air header pressure to degrade to the point at which outboard MSIVs began drifting. When outboard MSIVs were observed to be drifting, Operators closed the outboard and inboard MSIVs.
- PCIS Group Isolations - Following the scram, the RPV water level went below the RWL Level 3 setpoint which is an expected response. In addition, the actuation of RPS and the isolation of PCIS Groups 4, 13, and 15 is an expected response when reaching the RWL Level 3 setpoint. PCIS Group 1 (MSIVs and drains) isolated due to the expected loss of Condenser vacuum when MSIVs were closed.
- Loss of SC - The loss of TBCCW also caused all SACs to trip on loss of cooling. The loss of SACs caused the Instrument Air header pressure to degrade to the point at which the SC isolation dampers drifted closed. This resulted in a degradation of the Reactor Building vacuum.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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Corrective Actions

A work order was completed to inspect and repair the East TBCCW heat exchanger. A work order was also completed to inspect the West TBCCW heat exchanger and perform repairs as necessary.

In addition, corrective actions include: systematically comparing current heat exchanger inspection scope, frequency, and non-destructive examination techniques against previous historical failures to confirm heat exchangers are being properly tested and maintained against all known failure mechanisms; revising plant procedures to require consideration of Operating Experience for determining monitoring requirements; revising scheduling and tracking events to specify the use of advanced eddy current testing where applicable; reviewing heat exchanger component history for inclusion into Heat Exchanger program notebook; modifying existing Reactor Building Closed Cooling Water (RBCCW) and TBCCW tank level instrumentation or revising plant procedures to preclude possibility of false low level to tank overfilling; and identifying other susceptible heat exchangers and determining appropriate methods for maintaining heat exchangers when not in service.

This event was documented and is being evaluated in the Fermi 2 Corrective Action Program.

Additional Information

A. Failed Component: East TBCCW Heat Exchanger
 Function: Transfer heat between systems
 Manufacturer: Yuba
 Model Number: AEL
 Primary Failure Cause: Stress Corrosion Cracking

B. Previous Licensee Event Reports (LERs) for Similar Events:

Five previous LERs reported loss of SC function; however, corrective actions for previous events would not have precluded the loss of SC function during this event as provided below.

- 1) LER 2013-001 involved a loss of SC function due to an RBHVAC system equipment malfunction. The cause of that event was related to damper sequencing.
- 2) LER 2013-003 involved a loss of SC function due to an RBHVAC system equipment malfunction. The cause of that event was related a RBHVAC system trip caused by the lack of steam flow through a heating coil due to inadequate draining of the downstream steam trap.
- 3) LER 2015-001 involved a loss of SC function due to an RBHVAC system trip caused by a valid actuation of a freeze protection device.
- 4) LER 2015-004 involved the loss of SC function due to reverse rotation of the RBHVAC center exhaust fan during post-maintenance testing. The cause of the event was reversed electrical leads.
- 5) LER 2015-005 involved a loss of SC function due to an RBHVAC system equipment malfunction. The cause of that event was premature failure of a relay.